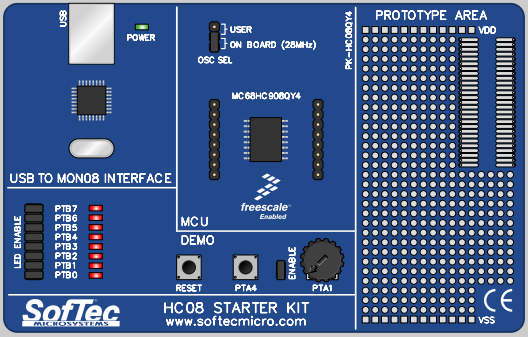
HC08

STARTERKIT



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PK-HC08QY4

User's Manual

SofTec® MICROSYSTEMS

Development Tools for the Embedded World

PK-HC08QY4
Starter Kit for Freescale MC68HC908QY4

User's Manual

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Written by Paolo Xausa

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1. Overview

What is the PK-HC08QY4 Starter Kit?

The PK-HC08QY4 Starter Kit is an entry level tool which allows you to get started with the Freescale MC68HC08 family of low-cost, high-performance microcontrollers units (MCUs). The M68HC08 Family is a Complex Instruction Set Computer (CISC) with a Von Neumann architecture. All MCUs in the family use the enhanced M68HC08 central processor unit (CPU08) and are available with a variety of modules, memory sizes and types, and package types.

The main features of the MC68HC908QY4 microcontroller are:

- High-performance M68HC08 CPU core;
- 4096 bytes of FLASH memory;
- 128 bytes of RAM;
- 8 MHz internal bus operation at 5 V, 4 MHz at 3 V;
- 3.2 MHz internal oscillator;
- 4-channel, 8-bit analog-to-digital converter (ADC);
- 2-channel, 16-bit timer interface module (TIM).

The PK-HC08QY4 Starter Kit has been designed for the evaluation of the MC68HC908QY4 microcontroller and the debugging of small user applications.

The PK-HC08QY4 Starter Kit takes advantage of the Metrowerks' CodeWarrior Integrated Development Environment (which groups an Editor, Assembler, C Compiler and Debugger) and the Freescale's MON08 interface, which allows the download of the user application into the microcontroller FLASH memory.

Together with CodeWarrior, PK-HC08QY4 provides you with everything you need to write, compile, download, in-circuit emulate and debug user code. Full-speed program execution allows you to perform hardware and software testing in real time. PK-HC08QY4 is connected to the host PC through a USB port. A prototyping area allows you to wire your own small application.

1

PK-HC08QY4 offers you the following benefits:

- Real-time code execution;
- In-circuit debugging;
- In-system programming and debugging through a MON08-compatible interface;
- Demo area with push-buttons, potentiometer and user LEDs;
- Prototyping area;
- Metrowerks CodeWarrior IDE (the same user interface of all Freescale tools), with editor, assembler, C compiler and debugger.

Note: *the PK-HC08QY4 starter kit has been designed for evaluation purposes only. Even though it has full-feature debugging options, its main limitations are:*

- *The target microcontroller is fixed (soldered to the board).*
- *The target microcontroller runs only at 5 V.*
- *The data transfer rate (PC to target and target to PC) is slow. This results in high programming times.*

For serious debugging, we suggest you to switch to the SofTec Microsystems inDART-HC08 Series of debugging/programming tools.

What is the MON08 Interface?

The HC08's integrated MON08 interface allows you to update the content of FLASH program memory when the chip is already plugged on the application board. The MON08 interface can be implemented with a minimum number of added components and board area impact.

PK-HC08QY4 features a USB-to-MON08 circuitry which allows the host PC to communicate to the microcontroller through a standard USB cable.

PK-HC08QY4 Board Layout

The PK-HC08QY4 board has the following hardware features:

1. **A "USB to MON08 Interface" section.** It contains the circuitry needed to electrically and logically translate MON08-like commands sent by the host PC through the USB cable to the MON08 interface of the microcontroller. The PK-HC08QY4 board is powered by the USB bus.
2. **A "Demo" section.** It features a RESET push-button, one user push-button, a potentiometer and eight user LEDs.
3. **A "MCU" section.** It contains a soldered, 16-pin MC68HC908QY4 device (in SOIC package) with connectors to access the I/O pins of the microcontroller for expansion prototyping. A 28 MHz clock signal is provided (used to generate an internal bus frequency of 7 MHz).
4. **A "Prototype" section.** You can wire your own circuit here. The prototype section features both a standard, thru-hole area (for mounting traditional components) and a SMD area (for soldering SMD components in SOIC package).

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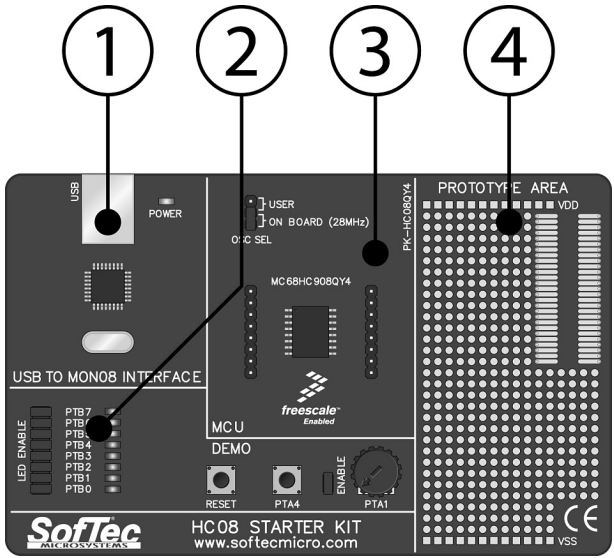


The PK-HC08QY4 Board

CodeWarrior Integrated Development Environment

PK-HC08QY4 comes with a free version of CodeWarrior Development Studio for HC(S)08 Microcontrollers, Special Edition.

CodeWarrior Development Studio for HC(S)08 is a powerful and easy-to-use tool suite designed to increase your software development productivity. Its Integrated Development Environment (IDE) provides unrivaled features such as Processor Expert application design tool, full chip simulation, Data Visualization and project manager with templates to help you concentrate on the added value of your application.

The comprehensive, highly visual CodeWarrior Development Studio for Freescale HC(S)08 Microcontrollers enables you to build and deploy HC(S)08 systems quickly and easily. This tool suite provides the capabilities required by every engineer in the development cycle, from board bring-up to firmware development to final application development.

To use the Special Edition (4 KB code-size limited), you must have a valid license key. Without the license key the product will run in a 1 KB code-size limited demonstration mode.

To request the license key, please refer to Metrowerks website.

This documentation covers the basic setup and operation of the CodeWarrior IDE, but does not cover all of its functions. For further information, please refer to the CodeWarrior on-line help and on-line documentation provided.

Recommended Reading

This documentation describes how to use PK-HC08QY4 together with Metrowerks CodeWarrior HC(S)08 IDE. Additional information can be found in the following documents:

- **PK-HC08QY4 Schematic.**
- **Metrowerks' Additional Documentation**—Available from the CodeWarrior IDE.
- **CPU08 Central Processor Unit Reference Manual**—Programming reference containing the description of the full HC08 instruction set.
- **MC68HC908QT/QY Data Sheets**.

Software Upgrades

The latest version of the PK-HC08QY4 system software is always available free of charge from our website: *http://www.softecmicro.com.* Metrowerks CodeWarrior upgrades can be found at *http://www.metrowerks.com*.

2. Getting Started

PK-HC08QY4 Components

The PK-HC08QY4 package includes the following items:

1. The PK-HC08QY4 evaluation board;
2. A USB cable;
3. The Metrowerks CodeWarrior HC(S)08 CD-ROM;
4. The SofTec Microsystems PK-HC08QY4 “System Software” CD-ROM;
5. A “QuickStart Tutorial” color poster;
6. This user’s manual.

Host System Requirements

The PK-HC08QY4 in-circuit debugger is controlled by an Integrated Development Environment running under Windows (CodeWarrior HC(S)08). The following hardware and software are required to run the CodeWarrior HC(S)08 user interface together with PK-HC08QY4:

1. A 133-MHz (or higher) PC compatible system running Windows 98, Windows 2000 or Windows XP;
2. 128 MB of available system RAM plus 500 MB of available hard disk space;
3. A USB port;
4. CD-ROM drive for installation.

Installing the Software

Note: *before to connect the PK-HC08QY4 board to the PC, it is recommended that you install all of the required software first (see below), so that the PK-HC08QY4 USB driver will be automatically found by Windows when you connect the board.*

PK-HC08QY4 requires that both Metrowerks CodeWarrior IDE and SofTec Microsystems PK-HC08QY4 additional components be installed in the host PC.

Note: *Metrowerks CodeWarrior HC(S)08 IDE must be installed first. Please note that PK-HC08QY4 only works with CodeWarrior for HC(S)08 version 3.0 or above.*

Installing Metrowerks CodeWarrior IDE

To install the CodeWarrior IDE insert the CodeWarrior CD-ROM into your computer's CD-ROM drive. A startup window will automatically appear. Follow the on-screen instructions.

Installing SofTec Microsystems Additional Components

The SofTec Microsystems additional components install all of the other required components to your hard drive. These components include:

- The PK-HC08QY4 USB driver;
- PK-HC08QY4 software plug-in for CodeWarrior HC(S)08;
- Examples;
- Documentation in PDF format.

To install the SofTec Microsystems additional components insert the SofTec Microsystems **"System Software"** CD-ROM into your computer's CD-ROM drive. A startup window will automatically appear. Choose **"Install Instrument Software"** from the main menu. A list of

available software will appear. Click on the **"PK-HC08 Series Additional Components"** option. Follow the on-screen instructions.

Note: *if you are installing the PK-HC08QY4 additional components on Windows 2000 or Windows XP you must have logged in as Administrator.*

Installing the Hardware

The PK-HC08QY4 board is connected through a USB port to a host PC. Connection steps are listed below in the recommended flow order:

1. Install all the required system software as described in the previous section.
2. Insert one end of the USB cable into a free USB port.
3. Insert the other end of the USB cable into the "USB" connector on the PK-HC08QY4 board. The green "POWER" LED on the instrument should turn on. Windows will automatically recognize the instrument and will load the appropriate USB driver.

Note: *both Windows 2000 and Windows XP may issue a warning the first time PK-HC08QY4 is connected to the PC. This warning is related to the fact that the USB driver used by PK-HC08QY4 is not digitally signed by Microsoft, and Windows considers it to be potentially malfunctioning or dangerous for the system. However, you can safely ignore the warning, since every kind of compatibility/security test has been carried out by SofTec Microsystems.*

Application Tutorial

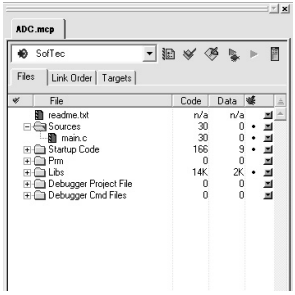
This section will provide a step-by-step guide on how to launch your first PK-HC08QY4 project and get started with the CodeWarrior HC(S)08 user interface.

The sample application reads the position of the potentiometer (connected to the microcontroller's ADC peripheral) and displays this value on the LEDs.

2

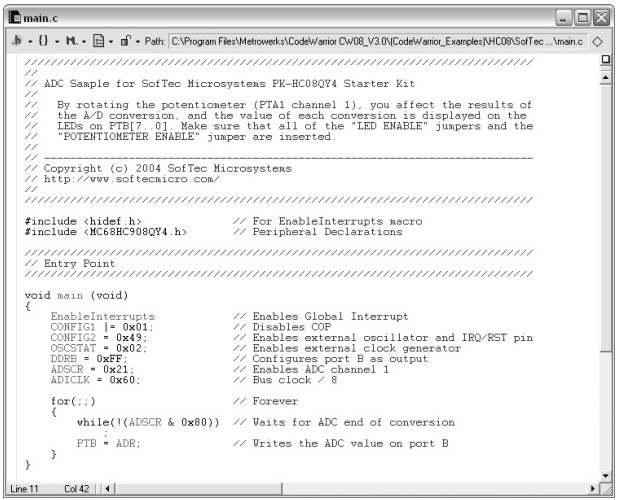
To execute the sample application, follow the next steps:

1. Ensure that the PK-HC08QY4 board is connected to the PC (via the USB cable).
2. Verify that both the J5 and J4 jumpers (near the potentiometer and the LEDs) are inserted. This is the factory configuration, and indicates that both the potentiometer and the LEDs are connected to the lines of the microcontroller.
3. Start the CodeWarrior HC(S)08 IDE by selecting **Start > Programs > Metrowerks CodeWarrior > CW08 > CodeWarrior IDE**. The CodeWarrior HC(S)08 IDE will open.
4. From the main menu, choose **File > Open**. Select the **"adc.mcp"** workspace file that is located under the **"\Program Files\Metrowerks\CodeWarrior CW08\(CodeWarrior_Examples)\HC08\SofTec Microsystems\PK-HC08QY4\C\Adc"** directory. Click **"Open"**. The following window will appear.



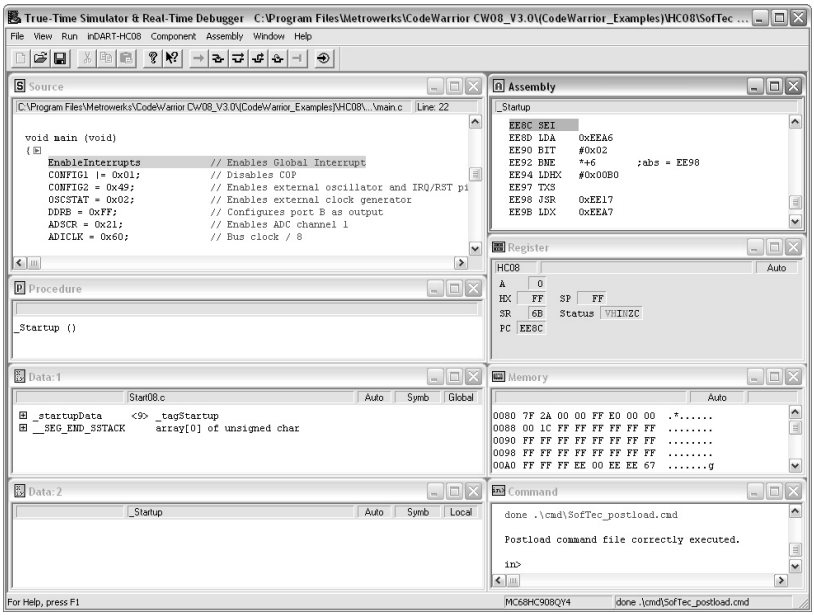
The *Project* Window

5. The C code of this example is contained in the **"main.c"** file. Double click on it to open. The following window will appear.


main.c
Path: C:\Program Files\Metrowerks\CodeWarrior CW08_V3.0\(CodeWarrior_Examples)\HC08\SofTec ...\main.c
//
//
// ADC Sample for SofTec Microsystems PK-HC08QY4 Starter Kit
//
//   By rotating the potentiometer (PTA1 channel 1), you affect the results of
//   the A/D conversion, and the value of each conversion is displayed on the
//   LEDs on PTB[7..0]. Make sure that all of the "LED ENABLE" jumpers and the
//   "POTENTIOMETER ENABLE" jumper are inserted.
//
// --
// Copyright (c) 2004 SofTec Microsystems
// http://www.softecmicro.com/
//
//
#include <hidef.h>   // For EnableInterrupts macro
#include <MC68HC908QY4.h>   // Peripheral Declarations
//
// Entry Point
//
void main (void)
{
    EnableInterrupts   // Enables Global Interrupt
    CONFIG1 |= 0x01;   // Disables COP
    CONFIG2 = 0x49;   // Enables external oscillator and IRQ/RST pin
    OSCSTAT = 0x02;   // Enables external clock generator
    DDRB = 0xFF;   // Configures port B as output
    ADSCR = 0x21;   // Enables ADC channel 1
    ADICLK = 0x60;   // Bus clock / 8
    for(;;)   // Forever
    {
        while(!(ADSCR & 0x80))   // Waits for ADC end of conversion
            ;
        PTB = ADR;   // Writes the ADC value on port B
    }
}
Line 11
Col 42

The Example's Source Code

6. From the main menu, choose **Project > Debug**. This will compile the source code, generate an executable file and download it to the PK-HC08QY4 board.
7. A new debugger environment will open.


True-Time Simulator & Real-Time Debugger C:\Program Files\Metrowerks\CodeWarrior CW08_V3.0\(CodeWarrior_Examples)\HC08\SofTec ...
File View Run inDART-HC08 Component Assembly Window Help
Source
C:\Program Files\Metrowerks\CodeWarrior CW08_V3.0\(CodeWarrior_Examples)\HC08\...\main.c Line: 22
void main (void)
{
EnableInterrupts // Enables Global Interrupt
CONFIG1 |= 0x01; // Disables COP
CONFIG2 = 0x49; // Enables external oscillator and IRQ/RST pi
OSCSTAT = 0x02; // Enables external clock generator
DDRB = 0xFF; // Configures port B as output
ADSCR = 0x21; // Enables ADC channel 1
ADICLK = 0x60; // Bus clock / 8
Assembly
_Startup
EE8C SEI
EE8D LDA 0xEEA6
EE90 BIT #0x02
EE92 BNE *+6 ;abs = EE98
EE94 LDHX #0x00B0
EE97 TXS
EE98 JSR 0xEE17
EE9B LDX 0xEEA7
Register
HC08 Auto
A 0
HX FF SP FF
SR 6B Status VHINZC
PC EE8C
Procedure
_Startup ()
Data:1
Start08.c Auto Symb Global
_startupData <9> _tagStartup
__SEG_END_SSTACK array[0] of unsigned char
Memory
Auto
0080 7F 2A 00 00 FF E0 00 00 .*......
0088 00 1C FF FF FF FF FF FF ....
0090 FF FF FF FF FF FF FF FF ....
0098 FF FF FF FF FF FF FF FF ....
00A0 FF FF FF EE 00 EE EE 67 ....g
Data:2
_Startup Auto Symb Local
Command
done .\cmd\SofTec_postload.cmd
Postload command file correctly executed.
in>
For Help, press F1
MC68HC908QY4
done .\cmd\SofTec_postload.cmd

Debugging Session Started

8. From the main menu, choose **Run > Start/Continue**. The program will be executed in real-time. By rotating the potentiometer on the PK-HC08QY4 board, you affect the results of the A/D conversion, and the value of each conversion is displayed on the LEDs.
9. From the main menu, choose **Run > Halt**. The program execution will stop. The next instruction to be executed is highlighted in the *Source* window.
10. From the main menu, choose **Run > Single Step**. The instruction highlighted in the *Source* window will be executed, and the program execution will be stopped immediately after.

11. In the *Source* window, insert a breakpoint at the **"PTB = ADR;"** instruction in the **main** function. To insert the breakpoint, right-click on the **"PTB = ADR;"** line and, from the pop-up menu, select **"Set Breakpoint"**.
12. Rotate the potentiometer slightly. Then, from the main menu, choose **Run > Start/Continue**. The application will restart from where it was previously stopped. The application will stop at the breakpoint location as soon as the next A/D conversion is done.
13. Issue a Single Step command (**Run > Single Step**). The new value of the A/D conversion will be displayed on the LEDs.

Congratulations! You have successfully completed this tutorial! You can continue to experiment with the CodeWarrior user interface and discover by yourself its potentialities. For an in-depth guide of all of the user interface features, select **Help > CodeWarrior Help** from the CodeWarrior HC(S)08 IDE's main menu.

Additional Examples

Additional examples can be found under the **"\Program Files\Metrowerks\CodeWarrior CW08\(CodeWarrior_Examples)\HC08\SofTec Microsystems\PK-HC08QY4"** directory.

3. Hardware Features

Introduction

PK-HC08QY4 is an in-circuit debugger—it programs files into the MC68HC908QY4 microcontroller and offers debugging features like real-time code execution, stepping, and breakpoints. Its debugging features are achieved thanks to the microcontroller's integrated MON08 monitor module.

Contrariwise to traditional in-circuit emulation (where the target application is executed and emulated inside the emulator), PK-HC08QY4 uses the very same target microcontroller to carry on in-circuit execution. This means that all microcontroller's peripherals (timers, A/D converters, I/O pins, etc.) are not reconstructed or simulated by an external device, but are the very same target microcontroller's peripherals. Moreover, the PK-HC08QY4 debugging approach ensures that the target microcontroller's electrical characteristics (pull-ups, low-voltage operations, I/O thresholds, etc.) are 100% guaranteed.

MCU Section

The "MCU" section contains the target microcontroller and the additional circuitry needed for the correct microcontroller startup. In detail:

- An MC68HC908QY4 microcontroller, together with all necessary filter capacitors.
- A jumper to select either an on-board generated 28 MHz oscillator frequency or an user provided clock signal (to be provided to the PTA5/OSC1 pin).
- A push-button in the "Demo" section is directly connected to the microcontroller's reset pin (PTA3/RST).
- All of the microcontroller's pins are available on the two connectors placed near the microcontroller.

USB to MON08 Interface

This section contains the circuitry needed to electrically and logically translate MON08-like commands sent by the host PC through the USB cable to the MON08 interface of the microcontroller.

The USB interface is based on a Freescale MC68HC908JB16 microcontroller, which features an on-board, low-speed USB peripheral.

The USB bus provides the power supply for the board. To protect the USB bus against short circuits that may occur during experiments, the power supply circuitry features a 200 mA auto-restore fuse.

Note: *even though USB specifications require low-speed devices to be used only with a captive or manufacturer-specific USB cable, we have decided to use a standard USB cable. We therefore recommend that you use the PK-HC08QY4 board with the USB cable provided or, if you use another USB cable, ensure that the cable length does not exceed 2 meters.*

Technical Note. *The MC68HC908QY device (like all devices of the HC08 family) features a monitor code which, through a serial communication line, allows the programming and the in-circuit debugging of the user application.*
The monitor code is executed in "monitor mode"; the user application is executed is "user mode". To enter the monitor mode some microcontroller lines must be properly driven (for further details please refer to the microcontroller's data sheet).
The PK-HC08QY4 "USB to MON08 Interface" section groups the circuitry needed to generate the required signals to enter the monitor mode and to communicate with the host PC's USB port. In particular, to enter the monitor mode, the "USB to MON08 Interface" circuitry generates/handles the following signals:

- *An high-level voltage signal (V_{TST} = 8.2 V) on the PTA2/IRQ pin of the microcontroller;*
- *A reset signal on the PTA3/RST pin of the microcontroller;*
- *The PTA1 and PTA4 pins of the microcontroller are driven to the following levels: PTA1 = 1, PTA4 = 0;*
- *A power supply line to drive the V_{DD} pin of the microcontroller to 0 V or 5 V;*
- *A single-wire, bidirectional serial communication line on the PTA0 pin of the microcontroller;*
- *A 28 MHz clock signal on the PTA5/OSC1 pin of the microcontroller (in order to communicate at a speed of about 27,000 baud over the serial communication line specified above).*

All of the above signals are generated by the MC68HC908JB16 microcontroller through a USB interface.

Demo Section

The "Demo" section groups push-buttons, a potentiometer, and user LEDs. In detail:

- Eight user LEDs, together with jumpers to connect them to/disconnect them from the microcontroller's Port B pins. All of the microcontroller I/O pins provide the required current to drive the low-current LEDs used by the starter kit, so no external transistors are needed.

- One user push-button, connected to the microcontroller's PTA4 pin. In order to read the status of this push-button, the microcontroller's internal pull-up must be enabled (through software) on this pin.
- One push-button connected to the microcontroller's rest pin (PTA3/RST).
- A potentiometer, together with a jumper to connect it to/disconnect it from the microcontroller's PTA1 pin.

3

Prototype Area

The prototype section features both a standard, thru-hole area (for mounting traditional components) and a SMD area (for soldering SMD components in SOIC package).

4. Debugging Features

Creating Your Own Application

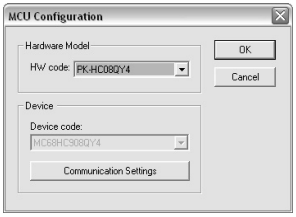
Using the Project Wizard to Create Your Application Skeleton

CodeWarrior HC(S)08 helps you get started with your own application by including a project wizard specific for HC08-based SofTec Microsystems boards. To create a new PK-HC08QY4 project:

1. From the main menu, select **File > New**.
2. A dialog box will appear. Select **"HC(S)08 New Project Wizard"**.
3. Follow the Project Wizard steps, making sure you select the correct microcontroller derivative you are working with and that the **"SofTec Microsystems"** target connection is used.

Starting your first Debugging Session

The first time you enter a debugging session (by selecting **Project > Debug** from the CodeWarrior's main menu) the *MCU Configuration* dialog box will open, asking you to select the debugging hardware connected to the PC. Make sure that the hardware code is set to **"PK-HC08QY4"**.



The *MCU Configuration* Dialog Box

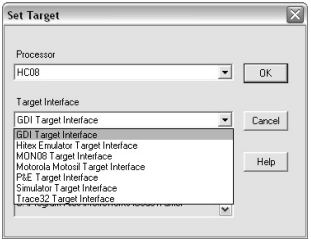
Using Existing Projects with PK-HC08QY4

If your project has been targeted to an emulator/simulator other than PK-HC08QY4 and you wish to use PK-HC08QY4 as the debugger for your project, please do the following:

1. If your project has been created with a version of CodeWarrior less than 3.0, make sure that the “target” command line option specifies the GDI target interface. To do so:

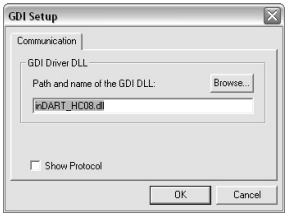
   a. Open your existing project’s settings dialog box.
   b. In the **“Target Settings Panels”** section, click on the **“Build Extras”** item.
   c. If, in the debugger’s argument edit box, the string “-target” appears, make sure that is set to **“-target=GDI”**.

2. CodeWarrior is interfaced to the PK-HC08QY4 engine through a so-called “GDI interface”. From the CodeWarrior HC(S)08 debugger interface, select **Component > Set Target** and choose **“HC08”** as processor and **“GDI Target Interface”** as target interface.



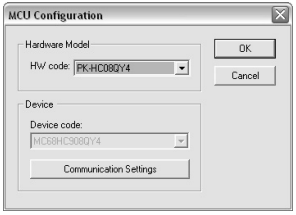
The *Set Target* Dialog Box

3. A dialog box will appear asking you to locate the GDI DLL file needed to interface with PK-HC08QY4. Select the **inDART-HC08.dll** file located into the **\Program Files\Metrowerks\CodeWarrior CW08\prog** directory (the PK-HC08QY4 board is based on the SofTec Microsystems’ inDART debugging engine).



The *GDI Setup* Dialog Box

4. The *MCU Configuration* dialog box will appear allowing you to select the PK-HC08QY4 board as the hardware debugger.



The *MCU Configuration* Dialog Box

5. On the CodeWarrior HC(S)08 debugger interface a new menu (**inDART-HC08**) will be created. From this menu, select **Load** and locate the object file your project is based on.

Limitations

Some hardware and software limitations apply.

- The PTA0, PTA2, PTA3 and PTA5 pins of the microcontroller are reserved—in particular, the PTA0 bit in the DDRA Register must not be changed (must be left to input);
- The MON08 lines (PTA1 and PTA4) and the PTA3/RESET line have a 1 KOhm serial resistor;
- Since the IRQ/PTA2 line is reserved (and it is driven to V_{TST}) the **"bil"** and **"bih"** Assembly instructions will result in no branch and always branch, respectively.
- The COP must be disabled at the beginning of the user code.
- The Break Module peripheral is reserved, and only one hardware breakpoint is available—however, you can insert a **"swi"** instruction into your code to generate a software breakpoint;
- The **"Halt"** debugging command (in the CodeWarrior IDE) will not work unless the IRQ interrupt is properly handled;
- 13 bytes of stack are wasted by the on-chip monitor—therefore the addresses from SP-13 to SP are reserved.

Notes and Tips

Entering Debug Session with CodeWarrior

When entering a debug session, the target microcontroller's FLASH memory is automatically erased, programmed with the user application, and the trimming value (if the trimming option is enabled) is automatically calculated and programmed.

Halt Debugging Handling

The **"Halt"** debugging command (in the CodeWarrior IDE) will not work unless the IRQ interrupt is properly handled. In particular, the following precautions must be taken in the application's source code.

1. Global interrupts must be enabled (use the **"cli"** instruction);
2. The IRQEN bit in the CONFIG2 register must be set to 1;
3. The IRQ interrupt vector must be handled;

4. The IRQ handling routine must include the following code:

```
bil *       ; Waits for the IRQ signal to go high
swi         ; Jumps to monitor code
rti         ; Returns from interrupt
```

Breakpoints and Swi Instruction

The HC08's on-chip debug module only handles one hardware breakpoint. However, you can force the program execution to stop at other specific locations by inserting the **"swi"** Assembly instruction on your source code.

Interrupt Execution during Steps

When issuing stepping instructions and there are pending interrupts, the debugger will not step inside the interrupt handling routine, but the whole interrupt handling routine is executed. An exception is when you single step on an Assembly instruction which branches to itself: in this case, interrupts which may occur are not handled.

Reading Peripheral Status

Care must be taken when reading some peripheral's status/data registers, since a reading operations may cause the clearing of flags. This may happen when the *Memory* window or the *Data* window is open, since these windows read microcontroller's resources during refresh operations.

Internal RC Oscillator Calibration

The MC68HC908QY microcontroller features an internal, trimmerable RC oscillator working at 3.2 MHz. The MC68HC908QY microcontroller is factory pre-programmed with a default trimming value in a dedicated FLASH location (specified in the datasheet). However, due to the different real-world conditions of the user's system, it is always suggested to recalibrate the internal oscillator to reflect the actual working conditions.

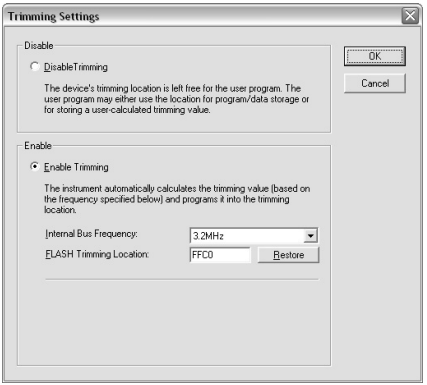
The *Trimming Settings* dialog box allows you to enable/disable the trimming feature. If enabled, it is possible to specify whether to save the calculated trimmed value in the default location (the location suggested either by Freescale or SofTec Microsystems, restorable at

any moment via the **"Restore"** button) or into a different location (specified in the **"Flash Trimming Location"** parameter).

The calculation of the trimmed value and its writing to the specified address are carried out transparently when programming the device (or during download when debugging).

If you don't want to reserve a FLASH location for the calibration, but use it as "normal" memory instead, it is possible to disable the trimming feature and therefore free the trimming FLASH location for application purposes.

To open the *Trimming Settings* dialog box choose **inDART-HC08 > MCU Configuration > Communication Settings > Trimming Settings** from the CodeWarrior main menu, after entering a debugging session.


Trimming Settings
Disable
DisableTrimming
The device's trimming location is left free for the user program. The user program may either use the location for program/data storage or for storing a user-calculated trimming value.
OK
Cancel
Enable
Enable Trimming
The instrument automatically calculates the trimming value (based on the frequency specified below) and programs it into the trimming location.
Internal Bus Frequency:
3.2MHz
FLASH Trimming Location:
FFC0
Restore

Trimming Settings Dialog Box

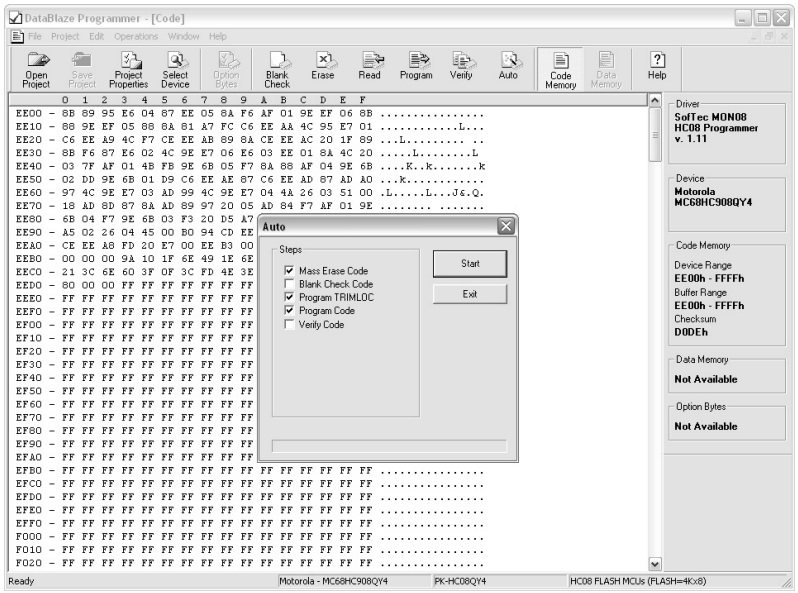
DataBlaze Programming Utility

A full-featured programming utility (DataBlaze) is also provided with the PK-HC08QY4 Starter Kit. To start the DataBlaze utility select **Start > Programs > SofTec Microsystems > PK-HC08 Series > DataBlaze Programmer**.

DataBlaze offers the following advanced features:

- Memory editing;
- Blank check/erase/program/verify/read operations;
- Project handling;
- One-button, multiple-operations programming (“Auto” feature);
- Automatic trimming calibration;
- Serial numbering.

Note: *due to the evaluation purposes of the PK-HC08QY4 starter kit (and therefore to the slow data transfer rate from the PC to the target and vice versa), the DataBlaze programming utility takes a long time to write to/read from the whole microcontroller memory. For serious debugging/programming, we suggest you to switch to the SofTec Microsystems inDART-HC08 Series of debugging/programming tools.*



The DataBlaze User Interface

5. Troubleshooting

Common Problems and Solutions

This section reports some common problems that may arise during general use.

Communication Can't Be Established with PK-HC08QY4

1. Make sure the PK-HC08QY4 starter kit is connected to the PC and powered on. PK-HC08QY4 is powered by the USB connection.
2. If you connected the PK-HC08QY4 board to the PC before installing the CodeWarrior user interface and the SofTec Microsystems Additional Components, the PK-HC08QY4 USB driver may not have been correctly installed on your system. Unplugging and replugging the USB cable is of no use, since Windows has marked the device as "disabled". As a consequence, CodeWarrior cannot communicate with the PK-HC08QY4 board.
   To restore the USB driver (provided both CodeWarrior and SofTec Microsystems Additional components have been installed), perform the following steps under Windows XP:

   - Plug the PK-HC08QY4 board to the PC.
   - Open the Control Panel (**Start > Settings > Control Panel**).
   - Open the **"System"** options.
   - Select the **"Hardware"** tab.
   - Click the **"Device Manager"** button.
   - The **"PK-HC08 Series Starter Kit"** device will be shown with an exclamation mark next to it. Double click on this device.
   - In the **"General"** tab, click the **"Reinstall Driver"** button. Follow the on-screen instructions.

3. Make sure you are working with the correct hardware model. To view/change the hardware model in use, choose **inDART-HC08 > MCU Configuration** from the CodeWarrior HC(S)08 debugger's main menu.
4. If the **inDART-HC08** menu is not present in the CodeWarrior HC(S)08 debugger's main menu, this is because the target has not been recognized by CodeWarrior ("No link to Target" appears in the status bar). In this case, from the **GDI** menu, choose **MCU Configuration** and verify that the hardware code is set correctly.

Stepping Execution is Slow

When the *Memory* window is open, step commands may execute slower, since the *Memory* window contents need to be refreshed after every step.

Communication Lost During Debugging

- Make sure that the target microcontroller's I/O bit corresponding to the PTA0 line (the MON08 line dedicated to the bidirectional communication) is set to input by your program.
- Make sure that your program works correctly. Among other things, your program must not access reserved memory locations.

Getting Technical Support

Technical assistance is provided free to all customers. For technical assistance, documentation and information about products and services, please refer to your local SofTec Microsystems partner.

SofTec Microsystems offers its customers a free technical support service at *support@softecmicro.com*. Before getting in contact with us, we advise you to check that you are working with the latest version of the PK-HC08QY4 system software (upgrades are available free of charge at *http://www.softecmicro.com*). Additional resources can be found on our HC08 online discussion forum.

Appendix A. Electrical and Physical Specifications

Operating Voltage	4.75 to 5.0 V DC (provided by the USB connection)
Power Consumption	200 mA (max)
Dimensions	137 x 86 x 15 mm
Weight	55 g
Operating Temperature	0 °C to 50 °C
Storage Temperature	-20 °C to 70 °C
Humidity	90% (without condensation)

Electrical and Physical Specifications

A

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Freescale Semiconductor:

PK-HC08QY4 PK-HCS08GB60